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A Monthly Journal

OF

NATURAL HISTORY,

FOR

RECORDING FACTS AND ANECDOTES

RELATING TO

QUADRUPEDS BIRDS, REPTILES, FISHES AND INSECTS.

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Collected Observations on British Reptiles.

By EDWARD NEWMAN.

(Continued from Zool. S. S. 1835).

THE COMMON FROG (*Rana temporaria*).

Rana temporaria, *Linneus, Systema Naturæ*, vol. i. p. 527.

There seems to me an obvious difference between frogs and toads in the character of the skin, that of frogs being moist like the mucous surface of our own lips and tongue, as if from some natural and continuous exudation, while that of toads is dry and harsh to the touch, often even making a slight rustling sound like that produced by gently rubbing the surface of brown paper. I do not know how far this superficial difference extends, that is to how many species or so-called genera, but it is very apparent in those British species with which we are familiar. The character is accompanied by a corresponding one in economy, frogs appearing to prefer moist situations generally within reach of water, and feeding by day; while toads, for the most part, frequent drier habitations, from which they emerge to seek their prey by night: in accordance with this diurnal and nocturnal activity the stomach of frogs is invariably found to contain sun-loving flies, especially of the genera Helophilus, Eristalis and Musca, while that of the toad contains night-wandering beetles and night-flying moths.

All authors agree as to the adaptability of this moist surface of the frog's skin to purposes of respiration; and all agree further as to the existence of a *cutaneous* respiration; but I am unable to quote a single author who has made the subject clear to my own apprehension. The idea originated with Spallanzani. The moist surface of the skin is supposed to be the medium of this respiration, and the moisture is said to be supplied from an internal reservoir, which Mr. Bell thus describes:—"Every one knows that when a frog is hastily seized, or even quickly pursued, it voids a considerable quantity of water, which is generally but erroneously supposed to be the urine. This water is limpid and pure, containing no traces of the usual elements of the urinary secretion: it is contained in a sac, which has also been mistakenly believed to be the urinary bladder. This is the reservoir to which I have alluded. When, therefore, the frog is happily placed in a damp atmosphere, or in water, the skin absorbs a quantity of water, which there is every reason to believe is secreted

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into the bladder just mentioned, where it is kept in store until the dryness of the skin requires a supply for the purpose of respiration, when it is again taken up and restored to the surface by which it had been first absorbed."—*British Reptiles*, p. 84. Mr. Bell further states that pulmonary respiration alone is not sufficient to support life without the aid of that of the cutaneous surface. I feel it due to the illustrious naturalists who have made this subject their especial study, to make this very imperfect allusion to the interesting question they have discussed; and also in some measure to myself, in order to show that I have not overlooked their labours: at the same time I am under the humiliating necessity of confessing that I have not the slightest practical knowledge of a subject which others have studied so deeply and found so interesting. I now proceed to detail more tangible characters.

The frog has both palatal and maxillary teeth: the palatal are short, slender, sharp-pointed and slightly recurved, the latter character appearing to render the return of their living food difficult or almost impossible; this is, perhaps, the only purpose for which these teeth are provided, since for purposes of mastication they are useless: the maxillary teeth are arranged in a single series round the upper jaw, and have characters almost exactly similar to the palatal teeth: the tongue is attached to the dilatable skin of the lower jaw for about half its length, and the remaining half is folded back on itself, the extremity which is notched pointing towards the throat, and being appressed to the internal opening of the nostrils, which it appears can thus be effectually closed at the will of the animal. The air taken in at the nostrils passes directly into the lungs. The nose is rounded, almost semicircular, and the gape of the mouth wide. The eyes are bright, and placed either on a level with the general surface of the head or projected at the pleasure of the animal, a character which I noticed as being much more obvious in the edible frog, under which species I shall again refer to it. The back is humped in a very striking manner: this peculiarity is due to the structure of the skeleton, which is without ribs. The fore feet are short and have four toes: of these the second is the shortest, and the third the longest; the first and fourth are of equal length: there is scarcely any appearance of a connecting web at the base. The hind legs are much longer than the fore legs, and are well adapted both for leaping and swimming: the first toe is the shortest, the second and fourth much longer and nearly equal in length, and the third the longest of all: they are connected by a web. As a natural result of this structure the frog swims with ease and celerity; it is a beautiful object in the water, its actions being replete with grace. The colour of the skin varies considerably, always more or less partaking of brown, but shading off to yellow, red, and green of different degrees of intensity, and always more or less blotched with darker brown: there is a large and conspicuous blotch of this darker colour on each temple behind the eye; and others form rather conspicuous transverse bands on the legs: the under side is always paler, sometimes approaching to milky white, and spotted more or less distinctly with pale smoke-colour.

The reproduction of the frog is a subject that has long engaged the attention of naturalists, and has been most successfully investigated. In the early spring the frogs are always to be found congregated in shallow ponds for this especial purpose, the males, which are almost invariably smaller than the females, generally preponderating in number: the females appear to be pregnant, although no copulation has yet or does at any time take place: as in insects, the eggs are full grown and to all appearance perfectly ready for extrusion without fecundation. This object is accomplished in the following manner: the males follow the females in the water, and each, mounting on the back of a female, grasps it round the waist immediately behind the fore legs: so entirely devoid are the frogs of that conjugal affection we see exhibited in some birds and sucklers, that it appears a matter of the utmost indifference to what object the male thus attaches himself: he will very commonly embrace any toad which he happens to meet with seeking the water for the same purpose of procreation; and sometimes this act is performed so energetically and his grasp is so tight as to strangle the wretched toad: more than once have I caught a frog thus attached to the dead body of a toad, and that so firmly that I was unable to separate them: thus unnaturally loaded, the frog will continue in the water for weeks, dragging with him his offensive burden. Very frequently two male frogs will attach themselves to one female; less commonly three; and in one instance I have found four so attached. On the indifference of the male frog as to the object to which he will attach himself, the Rev. H. Harpur Crewe gives a striking instance.

"Whilst staying at Rossway, near Berkhampstead," writes Mr. Crewe, "I noticed the following curious circumstance: I was walking along the bank of a small fish-pond in the garden, which was swarming with frogs and toads busily engaged in spawning, and was astonished to notice a great number of them promiscuously *in copulâ*. In every instance but one that came under my notice the union was between the male frog and the female toad, but in that one instance it was *vice versâ*." (Zool. 4097.)

It is also by no means a rare occurrence to find two males thus attached to each other; and Mr. Bell mentions an instance of two frogs attaching themselves to a pike: after quoting the famous passage from Isaac Walton about the Bishop in Bohemia and the Bishop of Thurgo, Mr. Bell proceeds thus:—"I have often heard my father relate an instance of a similar fact, though with somewhat more adherence to the simple truth of the case. As he was walking in the spring on the banks of a large piece of water at Wimpole, the seat of Lord Hardwicke, he observed a large pike swimming in a very sluggish manner near the surface of the water, having two dark-coloured patches on the side which he thought must be occasioned by disease: a few days afterwards he saw the same pike floating dead upon the surface of the water, and, having drawn it to land by means of a stick, he found that the dark-coloured masses which he had observed on the former occasion were two living frogs still attached to the fish, and that so firmly, that it required some force to push them off with a stick."—*British Reptiles*, 2nd edition, p. 96.

Notwithstanding all that has been written with more or less accuracy of the obstetric talents of the male frog, I believe that the real object is to disburthen himself of the so-called milt with which he is loaded, and this being cast loose in the water finds its proper destination, exactly as is the case in the desmogenous fishes: with the female, on the contrary, the spawn seems to be retained until contact with the male informs her that it will be properly fecundated; for no sooner has the male frog taken up his position as above described, than the female commences the duty of oviposition. The eggs consist of a small, spherical and almost black centre or yelk, and a transparent mucilaginous surrounding which corresponds with the albumen or white of a bird's egg, but which has no perceptible envelope either coriaceous or calcareous: each of these eggs receives the spermatic fluid which is continually shed by the male. I cannot find any thread connecting the eggs together as in the natterjack and toad, but they nevertheless adhere in masses which are inseparable except by the application of considerable force. The spawn is deposited at the bottom of the water, and the albumen of each individual egg absorbs water and increases vastly in bulk; thus the dark-coloured yelks become widely separated from each other, although the mass is still compact and coherent, and has the appearance of colourless transparent jelly dotted with small black beads. After remaining at the bottom a few days the mass rises and floats on the surface; and when the spawn deposited by a single frog has become thus swollen by the absorption of water, its disproportion to the size of the parent becomes very apparent: it not unfrequently exceeds her bulk at least tenfold, and those who are unacquainted with the water-absorbing process are often heard expressing their wonder that so small a body should have contained such a volume of spawn. When the spawn has risen to the surface of the water, or near it, the frogs of both sexes may be constantly observed riding upon the spawn, their heads alone appearing above the surface of the water, and occasionally bobbing up and down and emitting sonorous croakings that are described as musical, discordant, pleasing, gentle, agreeable or horrible, exactly as they happen to affect the mind of the auditor: so true is it that beauty and ugliness are not inherent qualities of the object thus described, but are conferred by the mind of the describer. These frog gatherings are very familiar to our English boys, and afford them the opportunity of indulging those cruel propensities which seem the attributes of their kind. Our German friends have viewed these love-feasts more philosophically, and many have described them in glowing terms.

The development of the tadpole from the egg, and of the perfect frog from the tadpole, have engaged the attention of naturalists in all ages; and the very striking correspondence between the metamorphosis of a frog and an insect has repeatedly been made the subject of comment. The state of egg almost exactly corresponds, and the larva of the insect is identical with the tadpole of the frog: from this stage insects vary amongst themselves: the beautiful and gradual transition from the larval to the adult form is precisely alike in the frog and those isomorphous insects which constitute the families Blattidæ, Locustidæ, &c., a fact which M. Quatrefages appears to have overlooked, when, in the admirable passage I am about to cite he comments with perfect truth on the absence in the life of the frog of any state "like the apparently torpid condition of the pupa." It is here most manifest that he has been in the habit of regarding all insect metamorphosis as amorphous.

On the metamorphosis of frogs, however, M. Quatrefages stands pre-eminent, and his observations are so immeasurably superior to my own that I shall copy from Dr. Lawson's translation.

"The development of frogs presents another curious phenomenon. It is this: the young animal, after it has left the egg, and before it has become a larva, is still in a semi-embryonic condition: at this period the digestive tube and its appendages are exceedingly rudimentary. The greater portion of the body is filled by a large mass of yelk or vitellus, enclosed by the skin, which has been formed for some time; and it is at the expense of this alimentary matter that the development proceeds. The external characters are in keeping with the imperfect condition of the animal at that period: the head is large and appears to be divided in two on the under surface, each half being prolonged as a sort of process by which the animal attaches itself to surrounding objects; as yet there are no traces of either eyes, nostrils, respiratory or auditory organs; and the belly, of an oblong form, is continued posteriorly as a short tail bordered with a ribband-like membrane. This primitive condition, however, does not last long. About the fourth day after birth the head, which is now as long as the body, has somewhat the appearance of a thimble; the mouth is provided with a pair of soft lips; the nostrils, eyes and auditory apparatus have made their appearance; the head is separated by a deep groove from the belly, which has assumed a spherical form, and from which spring a pair of opercula, clothed with little branching gills; and the tail has grown so much that it is now quite as large as the body. The mouth is very soon armed with a horny beak, capable of dividing the vegetable food; the intestine, which is now very long, becomes more fully formed and assumes a spiral arrangement; the tail is elongated and widened, and the little creature is then called a *tadpole*. At this period one of those alterations occurs which are so intimately associated with the ideas we are endeavouring to convey, that we must not pass them by in silence. Our larva first breathed by its skin alone, and afterwards by a pair of little branching gills attached to the opercula: about the seventh or eighth day, however, the opercula are gradually soldered to the abdomen, and the gills fade away and disappear. At the same time a set of new and more complex branchia are developed, in chambers situate on either side of the neck. The new gills are arranged in tufts attached to a solid frame-work of four cartilaginous arches, and are about a hundred and twelve in number for each side of the body. Here we see a rapid substitution of one organ for another, though both discharge their functions in the same manner, inasmuch as the respiration is just as aquatic in character after the alteration as it was before it. But the modifications of the respiratory apparatus do not cease here: before the tadpole can become a frog, it must do away with these second gills and replace them by lungs; and at the necessary time, a set of changes takes place analogous to those we have already described. The vascular tufts are atrophied, and the lungs, which till now were solid and rudimentary, open up and increase in size. The circulatory organs are correspondingly modified. The calibre of the large branchial vessels is diminished, and the pulmonary trunks increase in number and diameter. Later on, the solid parts of the branchial apparatus disappear also, the bones and cartilages being gradually reabsorbed. Eventually the alteration is fully accomplished, and there remains not the slightest trace of the former branchial apparatus. In this instance, not only has there been transformation and substitution, but an actual metamorphosis has occurred; for the respiration, which was aquatic before, has become atmospheric, and, strictly speaking, the animal, from having been a fish has been converted into a batrachian. If we examine any particular apparatus, we shall find it also presenting many curious phenomena in the course of its development. We shall find that as the herbivorous habits give place to carnivorous ones, the digestive apparatus undergoes a change adapting it to the new form of diet: the mouth increases in size and gape; the little beak organs, or, more correctly, the horny lips, are replaced by teeth, which are attached to the palatine arch, and not to the jaw; the intestine, which before was long and almost cylindrical, becomes shorter, and is inflated in certain portions of its length; and the abdomen, which had been almost spherical, becomes thin and slender: the metamorphosis may now be seen in its entire extent, and more distinctly as regards the locomotive system than any other.

"The tadpole at first exhibits no trace of either internal or external limbs; it swims about like a fish by the action of its tail, which is an extensive organ, longer and wider than the body, supported by a prolongation of the vertebral column, moved by powerful muscles, and supplied with large blood-vessels and numerous nervous branches: beneath the skin and muscles of the anterior and posterior regions of the body, two little projections appear at a certain period; these are the limbs, and are at first attached to the adjacent structures by the nerves and blood-vessels which are supplied to them: these projections increase in size, their appendages appear in due course, and eventually the hip and shoulder bones are developed. As soon as these locomotive organs enter upon the discharge of their functions, the tail begins to disappear. Its skin, muscles, nerves, bones and blood-vessels atrophy and vanish from our sight: they have not faded away, they have not simply fallen off, they have not been cast off by a species of moulting, as in the case of insect larvæ; they have been got rid of by none of these methods; their substance has been reabsorbed atom by atom; and hence, although it has ceased to exist, it is not the less alive on that account. We see, then, that frogs undergo complete metamorphoses not only in regard to their entire organism, but as to each set of apparatus, with the exception of the nervous system."

Clear and precise as is this account of the metamorphosis of frogs, there are not wanting naturalists who maintain that although the metamorphosis I have described is usual, yet that it is not necessary. In the April number of the 'Annals and Magazine of Natural History' for the year 1853, a Mr. Edward Joseph Lowe, F.G.S., &c., published a paper 'On the reproduction of frogs and toads without the intermediate stage of tadpole': it is a paper of great interest, and is not altogether unsupported by the previous observations of naturalists. Mr. Lowe fortifies his position by stating that young frogs have been dug out of the ground in the month of January: he writes thus:—"In digging in the garden amongst the strawberry-beds in the middle of January, a nest of young frogs was upturned: these were apparently three or four weeks old. This ground had been previously dug in the month of August, and many strawberry plants buried; it was amongst these plants in a state of partial decomposition, that these young ones were observed." I may remark that the statement scarcely establishes the author's idea that frogs may be matured without passing through the tadpole state, for it is quite as likely that a frog which had passed through the tadpole state as one which had not, should occur in the situation described. Mr. Lowe goes on to state that frogs are bred in cellars where there is no water for tadpoles, and continues thus:—"In mentioning this subject to Mr. Sidebotham, of Manchester, he informed me that young frogs, and in fact frogs of all sizes, were to be seen in his cellar amongst decaying dahlia-tubers: the smallest of them were only about half the size of the young frog when newly developed from the tadpole. He further stated that there was no water in the cellar, and no means of young frogs entering, except by first coming into the kitchen, a mode of entry if not impossible, highly improbable. Mr. Sidebotham never found any spawn." This observation goes rather beyond Mr. Lowe's hypothesis, for it not only dispenses with the tadpole, but proved the non-necessity of spawn also.

My notice of Mr. Lowe's paper induced the Rev. Alfred Merle Norman to send the following communication to the 'Zoologist' for 1853:—" Mr. Edward Lowe's paper on the reproduction of frogs without the presence of water, which appeared in the 'Annals' for April, and is quoted in the 'Zoologist,' is one most deserving the attention of all naturalists. In support of Mr. Lowe's fifth observation, I cannot help sending you these few remarks:—' Year after year I have observed the same circumstance, and to account for it has always been to me the greatest puzzle. It was in a wine-cellar that the frogs were seen, the exact position of which I must first attempt to describe. This wine-cellar had no other entrance than a close-fitting door, under which a moderate-sized frog could not possibly pass; nor do I think that even young ones, such as those seen, could have done so, but of this I cannot speak for certain: this door opened into a dairy, having a window communicating by a small area with the garden. Minute frogs were found continually, two or three years following, among the damp sawdust in the cellar: they were very small, not larger than if they had just assumed the perfect state. And now, as to how they got there: is it possible that they were brought into the cellar with the sawdust, and, from want of food, did not increase in size during that lengthened period? I should say not. We have now two propositions left—either they must by some means have found their way into the cellar, or they must have been bred in it. The nearest water to the cellar was a small pond in a field separated from the garden by a deep walled ha-ha: but I have never seen any tadpoles in that pond, nor do I think it likely there would be any there, as the water is very pure, coming from a spring not far off, and running in and out of the pond in a continued stream. But granting, for the sake of argument, that the frogs might have been bred there, to have reached the cellar they must have crossed the field, mounted the perpendicular wall of the ha-ha, traversed the garden, passed through the area and window into the dairy, and thence under the door into the wine-cellar, and this, too, in a party of some dozens!' "—*Zool.* 3912.

To the conclusions at which Mr. Norman seems to have arrived I ventured at the time respectfully to demur: the argument seems in all cases to run thus:—Suppose it impossible for the little frogs to have gained access to the situations in which they were found by any ordinary means such as those suggested, by passing through a kitchen, &c., how did they get there at all? Surely no one will venture on spontaneous cellar generation! and if it be admitted that the phenomena of generation and parturition took place at all, the parents must have entered by some way, although Mr. Norman says there was no means of entrance but under a close-fitting door. Now, if the parents *did* get in by any means whatever, it seems to me that the much smaller young ones *could* get in: the climbing of the wall of the ha-ha seems to me to offer no kind of difficulty to a frog, as we shall presently see.

The observations of Mr. Lowe, Mr. Sidebotham and Mr. Norman attracted very considerable attention, some writers dissenting from the inferences implied by their communications; and one, Mr. Garland, narrating a circumstance which supported if not established them. "I had a wine-cellar," says Mr. Garland, "about ten feet long by eight wide at the end, and leading out of a back kitchen, below the level of a small garden situated in the High Street in the middle of the town of Dorchester. There was only one door to the cellar, and one small window opening on a little square space with a railing over it upon the level of the garden, the path of which was flagged with large paving-stones. I had a wooden shutter fixed on the inside of my cellar, to increase the facility of obtaining an equable temperature for the wine, and which was constantly kept up and fastened. I found some large frogs in it the first year I went to the house; these I had taken out and the cellar thoroughly cleaned. I am quite sure no others could have obtained access thereto through the window, and, of course, they could not through the two kitchens; yet, to my great surprise, the next year I found frogs in considerable number, and of different degrees of size, some very small. They were again got rid of in like manner, and the cellar cleaned; but the same occurrence the happened next year: there was no sawdust, the wine being packed on laths."—*Zool.* 3989.

I leave the subject here, only inviting attention to the fact that the frogs thus apparently produced in or by the cellar, were "of different degrees of size," a fact that seems to raise additional doubts as to their origin. These interesting extracts are inserted here because of their bearing on metamorphosis. I now revert to the tadpole, concerning which, and as to its being in the ordinary course of nature a larval or imperfect frog, there can be no doubt. The food of this familiar object has been gravely discussed and much disputed: in reply to a question by Mr. Chennell on this subject, I received the following conclusive observations from the pen of Mr. Richard Quain Couch, a gentleman whose early death was a severe loss to the science of Natural History, and one perhaps never to be repaired.

"In answer to your correspondent, Mr. Chennell (Zool. 579), on the subject of the food of the tadpole and the frog, I beg to offer him my experience on the point in question. Soon after the tadpole has effected its liberation from the spongy envelope of the egg, it adheres, by means of a pair of hooks on the breast, either to the empty egg or to some other substance near; although it is frequently found lying on its side at the bottom of wells or ditches. In this state it is entirely inactive, or at most its activity consists in only occasionally flapping its tail: at this stage it takes no food, and must therefore be nourished by the remains of egg within it. As the temporary external branchiæ disappear, the tadpoles become more and more active, and proportionably more voracious. At this time they very actively search for food, though they do it without the least intelligence: they generally, when in confinement, place their mouths against the bottom of the vessel, and search indiscriminately in all directions to obtain it: and although on many occasions food was designedly placed near them, yet they never, in any instance, turned to it as if they perceived it either by sight or smell, but came upon it by accident: so it is also where they are at liberty in the ponds and ditches. They are said by some authorities to prefer a vegetable diet, and from some accounts indeed they might be supposed to reject all animal food; this, however, does not appear to be the case. In those which I have kept in confinement, I found that when I fed them on the water-cress, supposed to be their favourite food, they lived contentedly on it for about twenty-four hours, and then the strongest would attack their weaker companions, and in the end devour them. This act of cannibalism was generally prevented by feeding them on animal diet, but still they always showed a preference for their weaker companions. During the earlier stages of their development they are very active and voracious, but as the development goes on and the arms and legs are getting useful for progression they get very inactive, and their appetite nearly leaves them. In this state they lie very inactively at the bottom of the vessel, or leave the water and take shelter among the wet grass, and beneath stones in moist situations. So situated they become an easy prey to their more active and less advanced fellows, which rarely pass them without a bite. Hence, in this transition state from the tadpole to the frog, they are frequently found in a very mutilated condition. So voracious is their appetite, that if an individual in this helpless and advanced stage be left through the night with the others, it is sure to be found in the morning dead and half devoured. While their appetite is thus so voracious, it is not easily satisfied; for if a bit of beef or mutton be offered to them, they will fasten on it immediately they discover it, and remain so for seven or eight hours at a stretch, and then only give it up by force; and though they may be actively devouring it all that time, yet at the first favourable opportunity will return and renew their attack as if they had been kept without food for a week; provided it be animal food nothing comes amiss, and hence it is not to be wondered at that they should be found feeding on the common white slug, as your correspondent noticed. On more than one occasion I have found these young cannibals congregated into large black masses, busily occupied with something, their heads being placed centrally and their bodies regularly radiating from one point, they resembled a large black composite flower. On driving them away I have found them feeding on the dead body of a full-grown frog, and probably the very one that had given them birth. They have no kind of affection; anything in the shape of food is acceptable."—*Zool.* 676.

No sooner has the tail totally disappeared and the usual limbs of a frog been produced, than the mode of respiration becomes totally changed, and the metamorphosed animal instead of being purely aquatic becomes strictly amphibious, residing at pleasure in the water or out, just as it finds most agreeable: it is at this period that those remarkable migrations take place which have attracted so much attention, and have induced so many fabulous accounts of showers of frogs, accounts which it is quite impossible for a naturalist to believe, and equally impossible to persuade the non-naturalist to disbelieve. Certain atmospheric conditions are no doubt essential to this general movement among the juvenile frogs: it usually takes place after a shower, when the surface of the ground is moist: a certain amount of atmospheric humidity seems also absolutely essential to the successful prosecution of this migratory march. The frogs at this period often seem to radiate in all directions, some of their number taking up with the first congenial resting-place; others, more difficult to please, passing on and on until they find a locality exactly adapted to their taste. Here they establish a kind of home, shaded by or partially concealed by overhanging leaves, and here they lie in wait for their prey.

I have never seen a frog make even the slightest attempt to devour a lifeless object. I have tried in vain to tempt them with dead butterflies, dead beetles, dead cockroaches, and dead grasshoppers; but all to no purpose: life, or at any rate motion, seems necessary to impart a relish to the meal. Some writers have asserted that frogs devour plant-lice or aphides, and thus render a most important service to the gardener; but this I have been altogether unable to verify: the aphides with which I have tried to tempt a tame frog, failed to attract his attention: they were, as is their wont, of too lethargic a disposition to attract his notice, but a fly held buzzing between the fingers would at once excite him, and would disappear with a celerity that seemed altogether at variance with his usual sedate behaviour.

It has been often noticed as a fact worthy of record that a frog has been observed climbing a wall, or seated on the top of a wall, in a position he would not have attained by any ordinary means of progression. These records arise for the most part from our ignorance of the locomotive powers which a frog not only possesses, but very commonly employs. The Rev. C. A. Johns, a most observant zoologist, thus alludes to this phase of frog-life:—

"Three several instances, proving that frogs can and do climb, have fallen under my own notice: these are already recorded in print. A fourth came under my notice on the 27th of October last. I was digging for pupæ at the base of a large willow tree in the valley of the Itchen, near Winchester, with some young friends, when one of the party exclaimed, 'Look at this frog climbing up the tree!' I quickly ran round to the other side of the tree, and saw not one only, but five or six young frogs, from one to two feet from the ground, climbing up the rugged bark, and using their front and hind feet just as a sailor employs his hands and feet when ascending the rigging of a ship. One, which I did not myself see, was discovered at a height of five feet from the ground in the act of descending. It had been alarmed probably at our intrusion, and had fallen to the ground before I reached the spot; but I had no reason to doubt the accuracy of the statement, for two or three members of my party pointed to the exact spot from which it had fallen; and if a frog can climb two feet, there is no reason why it should not climb twenty or more."—*Zool.* 8861.

Mr. Reeks, in reference to this narrative, says, "Although I have never had the good fortune to observe frogs in actual progression up trees, I have frequently found them in, apparently to them, inaccessible places, such as the tops of pollard willows in the vicinity of streams — situations, in fact, which could only be attained by climbing."—*Zool.* 8927.

Frog history is so attractive and so abundant that it would be an agreeable and easy task to extend this chapter to a still greater length, but I forbear, leaving the Romance of their Natural History to be worked out by others: their longevity and abstinence whilst immured in stone or coal are prolific fields for the sensation naturalists, to whom I must abandon this most tempting theme.

EDWARD NEWMAN.

Notes from Spurn Point. By JOHN CORDEAUX, Esq.

OCTOBER 11th, 12th and 13th, 1869.

THERE is no season more favourable for an ornithological ramble on our eastern shores than the first fortnight in October; whether we choose the Lincolnshire coast, or that of Holderness, for our "happy hunting grounds," we are almost sure to obtain something worth having, and to find much more that is worth seeing and remembering. An invitation from a friend to join his yacht for a three days' cruise off Spurn and the mouth of the Humber came most opportunely for my purpose, and on the afternoon of Monday the 11th, I went on board the cutter lying in the Hawke Roads, Grimsby. At four in the afternoon we were anchored, under shelter of the land, half a mile to the N.W. of the Spurn lights.

In a former volume of the 'Zoologist' (S. S. 1317) I have given a short account of the long narrow ridge of sand-hills known as Spurn Point, extending trunk-like from the coast line of Holderness and terminated by the two lighthouses marking the entrance to the Humber, dividing the main sea from the estuary of that river. The nearest village is that of Kilnsea, four miles from the Point, and the average breadth of the promontory at spring-tides probably not much over one hundred yards. The whole coast is much of the same character, although on a smaller scale, as that described by Mr. St. John as fringing the Moray Frith. On the Humber side there is at low water a wide extent of mud-flat and mussel scalps exposed, the chosen haunt of hundreds of waders, which here feed in comparative safety. It was now low water, so, taking a couple of breech-loaders and a supply of cartridges, we landed on one of the banks. Scarcely did the keel grate along the gravel, before a multitude of gulls rose and flew out seaward, the greater part crossing the sand-hills. There were greater and lesser blackbacked gulls, old and young birds,—the latter species in considerable numbers,—herring, common and brown-headed gulls. We walked for two hours across these gravel-flats, till the returning tide washed up to our feet: curlews, knots, dunlins and gray plovers rose a-head and made off along the edge of the water in straggling lines of flight, each sounding his own alarm-note. Not a bird could we get near, excepting the godwits, which were alone approachable, and my first shot brought down a fat heavy "bartail." During the three days we spent at Spurn we found this species most common on the coast, and might, had we been so inclined, have shot several.

We did not reach the "cutter" till after dark, ringed dotterel rising close upon us, from each shallow pool, at almost every step, their clear melodious whistle heard above the roar of the surf. It was a brilliant night, each little star glittering with frost in the cold northern sky. A walk on deck, listening to

> "The grating roar
> Of pebbles which the waves draw back, and fling,
> At their return, up the high strand,
> Begin, and cease, and then again begin,
> With tremulous cadence slow, and bring
> The eternal note of sadness in."

and then to bed, rolled up in blankets on the couches in our snug little saloon.

October 13th. Up at 5.30, and on shore at six. A gray sea-roke drifting in across the sand-dunes, but aloft the pink cirri spoke of a fine and clear day. As we landed five mallards rose from the water's edge; and near the Point flocks of the common scoter were flying from the sea into the Humber; great and lesser blackbacked gulls hovered along the edge of the side; flocks of twites and linnets passed twittering overhead, coming in a direction along the sand-hills from the Yorkshire coast and flying towards the Point. There are thousands of the northern linnet now at Spurn, the ripe seeds of the sea-purslane, a common plant on these sand-hills, are the great attraction.

I distinguished the note of the snow bunting, and saw a single bird of this species perched on the "tide-ridge."

8 A. M. Went off to breakfast and found a pair of guillemots in winter plumage, swimming near the yacht. An attempt to bag them was a failure.

9.30 A. M. When rowing ashore two strings of tern passed overhead. I recognized the common and lesser terns, both of which species breed at Spurn. There is also another tern which nests in small numbers here, namely, the Sandwich (*Sterna Boysii*). Few young birds get off: their breeding is a mere farce, as I find a regular trade is carried on from this place with collectors. In the breeding-season an almost daily search of the coast is made and every egg found is taken. This short-sighted policy must ultimately drive the birds to seek out some less frequented situation for their summer residence. On landing we walked round by the Point towards the sea-side of the hills, and thus came in for a very interesting sight: a school of forty or fifty porpoises was passing out to sea from the Humber, and within gunshot of the shore. Some of these were of large size, and fully ten feet long: they swam in two irregular lines, and the constant rolling over of so many dorsal fins at once was most striking. Now and then some big fellow would spring almost sheer out of the water. In front of the porpoises a mixed flock of gulls was hovering and screaming, making dashes at any little fish driven to the surface by these sea-dogs. Hundreds of dunlins were seen on this part of the coast, and one small flock of snow buntings. During the night some small parties of goldcrests had arrived and were scattered amongst the "marram" on the hills near the lighthouses. The name by which these little fellows are known at Spurn is that of "woodcock pilots," as they invariably arrive a few days in advance of the woodcock. No bird is more frequently taken at sea on board the fishing-smacks at this season than the little goldcrest, and in foggy weather hundreds perish. In rough thick weather it is only the strongest of their race that can pass the "swan-bath" of the Viking—the wild north sea.

I noticed during the day several common wrens on the coast, and have regretted ever since not procuring specimens, as they struck me as a slightly larger and stronger bird than the wren of our gardens, and may perhaps have proved representatives of the northern species. On the summit of about the only bush on the promontory was a beautiful male brambling (*Fringilla montifringilla*), which my friend shot. Near the same place were a few stonechats.

As we walked over the sand-hills we disturbed numbers of moths, the yellow underwing and silver Y, and many red admiral and lesser tortoiseshell butterflies. I remarked several species of Fungus; amongst these the common "hinkhorn." The only plants now in flower were the ragwort and the pretty pink crane's-bill. During the morning we got long and fruitless shots both at the sheldrake and redthroated diver: the latter bird had the throat white. Returning across the mud-flats on the Humber side of the hills my friend got a long right and left, bagging a godwit with his first, and a fine immature male great blackbacked gull with his second barrel: it was only by wading out far and deep that the latter was recovered. Near the chalk bank, where some years since the sea broke across into the Humber, I saw two rock pipits, the only birds of this species seen. The hooded crows arrived about the 9th, and were now everywhere in small parties foraging along both coasts.

At 3 P.M. we were on board again, weighed anchor, and setting main, fore and jib sails, stood across towards the opposite coast; passed the Haile buoy off the dreaded "Donna Nook" on the Lincolnshire side, and then tacked and ran to the east of the Newsound light-ship. Our object was to look up the redthroated divers. Several guillemots and two or three puffins were seen, but, so far, no large divers. At last I caught sight of two swimming together, about a quarter of a mile away off the starboard bow. We had an exciting chase, and although we got out the boat to circumvent them, they finally escaped: there was scarcely any breeze at the time, and the divers went to windward much more rapidly than we could. The glass showed one of these birds to have the cheeks and front neck pure white; the other and larger of the two had the throat dark. I dare not say how many shots were fired, but having only No. 6 in the cartridges is some extenuation of our failure—at least we choose to consider it so. Another dark-necked diver never let us approach nearer than three hundred yards. At 6.30 P.M. we were back at our anchorage off the Spurn lights.

October 13th, 6 A.M. Again on shore. The only valuable bird seen during our morning walk was a Richardson's skua: it was flying close in along the coast, but took precaution to take a wide sweep out to sea when opposite our lurking-place. This same bird had been observed during the morning from the yacht, harrying the "brown-heads." There was a stiff breeze now blowing, making it necessary to get on board again immediately. The wind had chopped suddenly north.

Half-an-hour later and the "little lady" was beating out of the bay, with a heavy sea running. Near the Bull-float light-ship we picked up a heavily laden boat containing three men and a boy, considerably done up: the poor fellows had pulled for twenty-six hours without intermission, having separated from their smack in a fog twenty miles from the Humber mouth.

During the run home a small bird flew across our bow suspiciously like a little auk. My friend had seen a similar bird off the mouth of the Humber during the previous week, and thought it a young guillemot, but this could hardly be the case at this season.

During our short stay at Spurn we had seen thirty-eight species of birds. An interesting feature of the autumn Ornithology of the Point was the juxtaposition of summer and winter visitors: thus along the coast where the terns were fishing ran troops of knot, godwit and gray plover. On the sand-hills twites, bramblings and snow buntings fed, while troops of swallows were still careering aloft in full vigour and enjoyment.

I have to thank Mr. Richardson, of Beverley, for the following notices of birds shot at or near Spurn during the autumn:—

Spotted Redshank: Knot in Summer Plumage at Spurn.—A Mr. Beautyman, innkeeper, Beverley, was at Spurn on the 23rd of August, and shot an immature male spotted redshank; also a male knot in full summer plumage.

Stork (Ciconia alba) *in Holderness.*—Mr. Richardson saw at Mr. P. Lawton's, innkeeper, Easington, a white stork, which was shot near Withernsea, early in September, by a man named Crawforth.

Peregrine Falcon and Curlew Sandpiper at Spurn.—A gentleman who was at Spurn, with Mr. Richardson, early in October, shot on the 8th a peregrine falcon, a male of the second year, and on the 9th a male curlew sandpiper from amongst a flock of dunlin.

JOHN CORDEAUX.

Great Cotes, Ulceby, Lincolnshire,
October 19, 1869.

Life-Histories of Sawflies. Translated from the Dutch of M. S. C. SNELLEN VAN VOLLENHOVEN, by J. W. MAY, Esq.

(Continued from S. S. 1736.)

NEMATUS BETULÆ, *Hartig.*

De Geer, *Mémoires* (Goetze's translation), ii. 2, p. 261, tab. 37, fig. 23.
Hartig, *Blatt und Holzwespen*, p. 219.

Nematus fulvus, capite fusco, thoracis dorso ac pectore nigro maculato, alis iridescentibus, stigmate fusco luteo-marginato, tarsis posticis fuscescentibus.

We are, I believe, indebted to De Geer for all that is at present known about this insect. Hartig has simply copied the description of the Swedish naturalist, and appears never to have seen the insect alive, either as larva or imago. De Geer's very short description comes after that of Nematus perspicillarus, *Klug*, which species is mentioned by Hartig under the name of Nematus melanocephalus, and agrees very closely with the one under consideration.

I had at first intended to have followed the example of my predecessors, and treated of these insects in succession: I was, however, afraid that this would oblige me to postpone both descriptions for too long a time, as I have not met with the larvæ of perspicillaris during the last fourteen years, and my drawings only give the larva in its very early and its latest stages; I also found that I had no representation either of the pupa, the cocoon, the egg or the perfect insect: I thus thought it better to divide them, however nearly they may be related, and describe, in the first instance, the metamorphosis of Betulæ, the less known of the two species.

Having by means of her saw made openings in a birch leaf, the female deposits her eggs between the epidermis and the parenchyma, on the under side of the leaf. I found some leaves, which had been thus attacked, on a small birch tree in my garden, early in June, 1862. The larvæ on quitting the egg were entirely of a blackish green colour, and ate out the substance of the leaf between the veins, but left untouched the point of the leaf, as also the places or little receptacles in which the empty egg-shells were concealed, so that in this condition the leaf had the appearance of our fig. 6, in which *a a* represents the places where the eggs have been deposited.

After the first moult the young larvæ were of the size represented at fig. 2 on our plate; fig. 3 representing the same larva magnified $2\frac{1}{2}$ linear. The whole body was divided into folds by numerous wrinkles; the colour on the dorsum was dark green; the sides and the ventral surface, together with the twelve prolegs and the two anal legs, were grayish green, somewhat yellowish here and there, more especially on the sides of the eleventh and last segments. The head and a triangular mark on the anus were shining black; the thoracic legs grayish black, annulated with white. These larvæ when feeding usually raised the last five or six segments of the body in the air.

Some time later, in the month of June, when they were half-grown, their colour was somewhat different. I noted their appearance at that time as follows:—head sordid dark green; body green, yellow at the sides, with an orange spot on this yellow portion of each segment, except on the last two. The whole body was covered with little oval dark warts. All the legs pale green; the thoracic legs with black claws. A black spot on the anal valve, and below it, on either side, a pale green spine having a black point.

Some days later—namely, on the 22nd of June—they had moulted for the last time, and had now the appearance represented in our fig. 4. The following are my notes of it. Head brownish black, the posterior margin and the trophi being paler; the dorsum of the abdomen deeply wrinkled, dark green, becoming paler towards the apex, where the colour has that peculiar reflection which is also observed on the skin of the larvæ of Notodonta dictæoides. On the sides of the segments from the first to the eleventh are yellow spots of a somewhat triangular form; see fig. 5, representing the side of the fifth segment. Between and below these yellow spots the colour is pale green; the ventral surface and all the legs are likewise of this tint. The thoracic legs are armed with brown claws. The entire body is covered with oval and elliptical shining black spots; of these three are above and three on the before-named yellow spots, one in advance and two behind on each segment, added to which there are two transverse spots above each leg. Above the anus is a large ill-defined black spot, and on each side below this a green spine with black tip.

When full-grown the larvæ were 22 mm. long. They were very voracious, and moved about very rapidly in the box, in which some of them were kept. On the birch tree, however, I observed others almost always quiet and feeding. They seem to be lovers of freedom who find even a roomy prison too narrow. When one of these larvæ was touched by an Aphis the former moved its tail rapidly about;

they did not, however, carry this part of the body raised in the air, and, so far as I was able to observe, they had no ventral glands.

After reading the description of my larvæ, it may perhaps be considered that I have no right to call this species by the name of Betulæ, *Hartig*, as there is a considerable difference in the descriptions of the larvæ by De Geer and myself. However, De Geer says expressly, and Hartig repeats the same words, "Sonst ganz glatt, ohne Punkte und Flecke;" that is to say, in addition to the yellow spots on the sides. I at once acknowledge that this difference is very great; and yet I am more willing to suppose that De Geer may have been mistaken than that there is a third species agreeing in almost all points with the perspicillaris of Klug and the Betulæ of Hartig, and also, like the latter, feeding on the birch.

On the 25th of June the larvæ spun up on the surface of the mould, which I had put into the box. The cocoons were of a more or less dark brown and simple: this forms one of the characteristics of the species. The imagos made their appearance on and after the 12th of July. The female is 7 mm. long, expanding to 15 mm.; the male is a little smaller. The head in both sexes is brown as far as the antennæ; the margins of the black compound eyes and a crescent above the antennæ are brownish yellow, the ocelli black. The antennæ are sordid brown with pale rings on the joints. Mouth yellowish white, with shining brown mandibles.

The thorax in the female is yellowish orange, with three shining black spots on the superior surface and four on the inferior; the former are broadly elliptical, one, in advance, being on the central lobe, the other two a little behind on the lateral lobes (fig. 7). Of the four on the breast two are in the form of triangles on either side of the neck on the prothorax, while the two others are at the extreme lowest point of the mesothorax. In the male the three dorsal spots are united into a single large round spot, in which the scutellum makes a notch; this latter is brownish and posterior to it, between and behind the cenchri, is an irregular black spot. The abdomen is orange, paler in the female than in the male. The sheaths of the saw are brown; the anal styles yellow. Legs yellow; in the female the posterior tarsi are brownish, decidedly brown in the male. All the claws are brown; between them are rather large pulvilli.

The wings are translucent, strongly iridescent, and have a yellow tinge at the base. The costal and postcostal nervures are yellow, margined with black on the inner side; the externo-median nervure with its branches is black, the remaining nervures are brown. Stigma brown, with a pale inner margin.

The imagos appearing, according to our observation, in July, points to the conclusion that there are two generations in the year, the second of which most probably winters in the cocoon. I think I remember to have seen the larvæ of the second brood, but as I have not made any note of this circumstance, I cannot state it as a fact.

Ornithological Notes from Stirlingshire : July to October, 1869 (continued from S. S. 1799).—July 13. To-day received a pure white egg of the kestrel, which was taken out of the bird, on the 14th of May, in Selkirkshire. *Note.*—Also this year received an almost pure white egg of the merlin from the same locality, which was taken from the nest : a few small black specks at the large end faded much shortly after it was taken from the nest.

August 4. A white jackdaw, which has been frequenting this locality for some time, first observed by me to-day. I watched him for some time through a glass: strictly speaking, his colour was not white, but a dull ashy or silvery gray, the head and breast being of a darker or smokier? tinge. He was much persecuted by others of the tribe, as well as by the rooks, though at the same time, individually, they seemed rather afraid of him. Since the above date I have seen him repeatedly, but of late he has disappeared.

August 6. But few birds have as yet arrived at the coast. I shot a couple of oystercatchers and some other common species, but saw nothing rare there to-day.

August 21. A local collector here informed me to-day that in one small wood he this season discovered two pairs of nightjars' eggs and one pair of young birds: the wood is not above two acres in extent.

September 1. Whilst partridge shooting to-day, near the river-side, I saw distinctly a green sandpiper—the first I have heard of in this county.

September 5. Saw plenty of sanderlings on the coast, and shot four specimens.

September 7. Not a sanderling to be seen, though other species were as abundant as usual. Got one whimbrel out of a company of three: these birds, I believe, in autumn are commoner on the east coast than on the west. Bartailed godwits were not quite so numerous as in some seasons.

October 18. Gray plover in considerable numbers on the coast: I saw twelve in one flock, and shot three others: a distinct though faint shade of golden colour was visible on the feathers of the back. Saw a flock of about twenty shieldducks, principally males, and a good many other ducks out at sea.

October 20. Only saw one gray plover at the coast, but there were few birds on the beach of any kind.

October 29. Woodcocks, as usual here, arrived with the first frost of the last two days, and snipe also; the latter in considerable numbers. Ducks are now plentiful on the Firth.—*John A. Harvie Brown ; Dunipace House, Falkirk.*

Rare Birds near Hastings.—A little gull was shot from a boat a few days ago: it was flying in company with terns at the time. A fine raven and a female snow bunting have also been shot on the Levels here. A stormy petrel was observed, about the same time, some little distance from the shore. A gray phalarope was shot on the beach near Bover Hithe, early in the present month. Three wild ducks alighted in the artificial water in the park here last week, and stayed all day with the water-fowl. Whilst I write it is snowing fast.—*Alwin S. Bell*, *3rd West India Regiment; Hastings, October* 28, 1869.

Dartford Warbler in St. Buryan, near Penzance.—I have not hitherto detected this little warbler in the Penzance district; but I have seen a specimen to-day which was obtained by Mr. Vingoe's son yesterday in Trevider Moor.—*Edward Hearle Rodd; Penzance, October* 30, 1869.

White Partridges (? Ptarmigan) near Ganton, Yorkshire.—"Perhaps it would be interesting to some of your numerous readers to hear that two brace of beautiful white partridges have just been shot in the preserves of the Rev. R. H. Foord, of Foxholes Rectory, near Ganton. It is known there are a few more birds of this description in the same place, and this circumstance has raised considerable curiosity, as such birds have never before been seen in that neighbourhood. Their great rarity has induced the Rev. R. H. Foord to have them stuffed, for which purpose he has sent one brace to Mr. J. Darley, birdstuffer, Dock Street, who will be happy to allow anyone curious on the subject to inspect them whilst in his charge.—*Jno. B. Grainger; 35, Liddell Street, Hull, October* 19, 1869." The above, recording the capture of some white partridges (probably ptarmigan) near Ganton, in Yorkshire, is a cutting from the 'Hull and Eastern Counties Herald' of the 21st of October.—*Alwin S. Bell.*

Little Bustard on the Lizard Land.—A very fine bird of this species (which from its size I should think was a male) came into the hands of Mr. Vingoe, for preservation, yesterday, from the Lizard. The plumage was entirely plain from the throat downwards, showing no traces of the crescentic black markings which characterize the male in summer plumage. The roseate tint which pervades the basal parts of the feathers and the down on the back and breast next to the skin quite equal in intensity the under plumage of the roseate tern. The Lizard district has afforded both bustards to the Cornish Fauna: the great bustard in my museum had been obtained from that neighbourhood.—*Edward Hearle Rodd; October* 30, 1869.

Rednecked Phalarope at Marlborough.—A specimen of the rednecked phalarope was shot by one of our pupils, Featherstone, who lives with his father in the town. The bird's plumage was in the transition state between its summer and winter dress, but, having been submitted to Mr. Newman, there is no doubt about the species.—*T. A. Preston; Marlborough College.*

Extraordinary Flight of Landrails.—Have you heard of the extraordinary flight of landrails which visited this neighbourhood in the early part of September last? Landrails are usually very sparsely distributed through this district,—an open corn-growing country,—and three or four in a season are about as many as I usually meet with. During the first week of September I found upwards of thirty in three days, and on a neighbouring property the owner killed upwards of fifty (seventeen in one small clover-field of two acres), and probably found a good many more. All these birds were lean and poor, and came in with a north-east wind.—*W. O. Hammond; St. Alban's Court, Wingham, Kent.*

Winter Puffin at Marlborough.—A specimen of the puffin was caught by hand on the banks of the Kennet, on the 25th of October. The postman, George Scott, whilst walking by the river, noticed the bird, and as it appeared to be a strange visitor, he procured some assistance and ran it down. It was in very poor condition, probably having been driven inland by the rough weather of September, and only just able to support itself in its new home.—*T. A. Preston.*

Varieties in Lepidoptera.—Having for many years continued experiments on the larvæ of Arctia caja without any marked results, I this year tried another of a different nature. I selected the tortoiseshell butterfly, as one of the least variable species we have, and I procured several broods of young larvæ just emerged from the egg. These I kept in a dark box until I had all ready, and then I divided each brood into three lots, putting one-third into a box in my photographic room, which is lighted with orange-coloured glass, one-third into a box lighted with blue glass, and the ventilators carefully shaded, so that only light of a blue colour could reach the larvæ; the remainder were put into an ordinary cage, in the natural light. The latter fed up and came out into butterflies in the usual time. Those in the blue light were not healthy, and though every care was taken at least fifty or sixty died before changing, and a considerable number changed into chrysalides, and then died: those that came out into perfect insects were very much smaller than usual. Those lighted by orange-coloured glass fed up very well, but many of the two first lots had come out before one of them changed into chrysalis; scarcely one of them died, and I examined each one before I allowed it to fly, to see what effect had been produced. I retained a few specimens of each lot, and now proceed to describe the difference. Those reared in the blue light differ from the ordinary form in being on an average much smaller; the orange-brown is lighter in shade, and the yellow and orange run into each other, instead of being distinct and separate. Those reared in the non-actinic or yellow light are also smaller; the orange-brown is replaced by a salmon-colour, the venation more strongly marked, and the blue dashes at the edge of the wings in the usual form, are in these of a dull slatey colour. One evening I found about sixty butterflies out of chrysalis, of those in the photographic room, and taking each one carefully I examined them all and allowed them to fly; shortly afterwards I found the whole of them had settled against the wall of the house, and presented a most remarkable appearance: they remained there more than half an hour: the western sun was shining against the wall, and it is not unlikely, when being suddenly brought from the red light where they had spent all their lives to the bright daylight, they had been so dazzled as to act in this peculiar manner. The results of this experiment do not show any very startling change in colour, such as one would have expected from the known effects of light on plants, and from the very much more strange varieties one now and then meets with, which cannot have been subjected to such severe treatment: still when we consider that even this difference is caused in one generation, and in the course of a month, it is a very suggestive fact, and leads one to think that light has certainly as much or more effect on the colours of Lepidoptera than the difference of food, and might in a long series of generations lead to very material changes in both form and colour, and perhaps considerably modify our ideas of what constitutes a species.—*Joseph Sidebotham; Manchester.*

30 DE69

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Newman's Botanical Drying Paper.

(FORMERLY BENTALL'S.)

In soliciting the attention of Botanists to his botanical paper, Edward Newman begs to state that it is manufactured expressly for the purpose of DRYING FLOWERING PLANTS, FERNS and SEA-WEEDS FOR THE HERBARIUM. It possesses all the qualities required in such paper, preserving form and colour in the best possible manner, and having the peculiar advantage of seldom, if ever, requiring a change of sheets whilst the plants are being dried, a process by which much time is lost. Its stoutness and durability also combine to render it economical, making it *practically* quite as cheap as ordinary paper sold at a lower price. Edward Newman feels much pleasure in being able to state that its merits have been fully proved by our most eminent Botanists, extracts from some of whose valuable Testimonials in its favour are here subjoined.

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